

# Exhibit C

# TechEd

Europe 2014

## Big Compute in the Cloud with High Performance Computing on Azure

DBI-B216

Mark Scurrell



# What is Big Compute and HPC?

## Example Scenarios:

Media transcoding

Rendering

Image analysis & processing

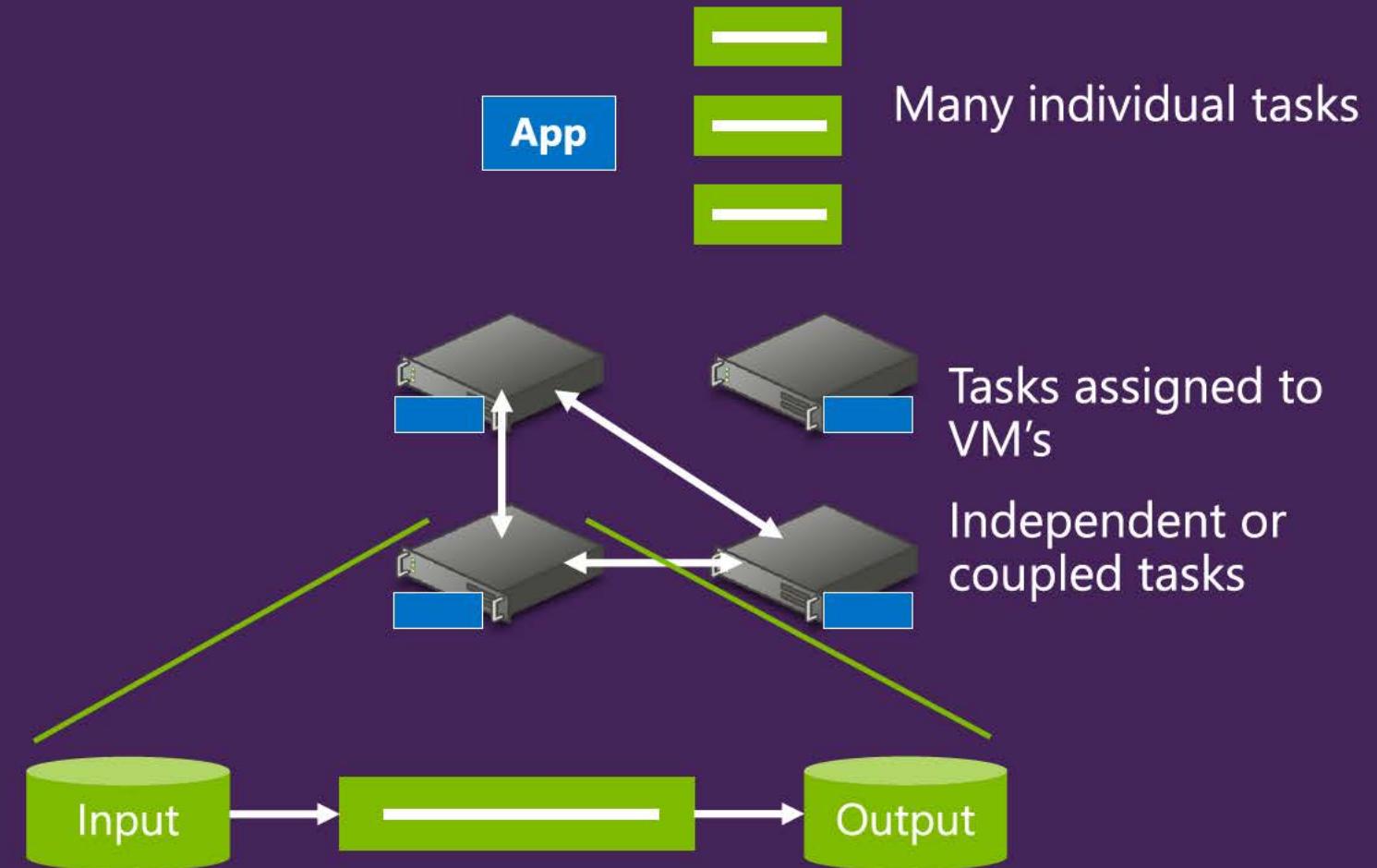
Builds

Test execution

Fluid dynamics

Monte Carlo simulations

Engineering stress analysis

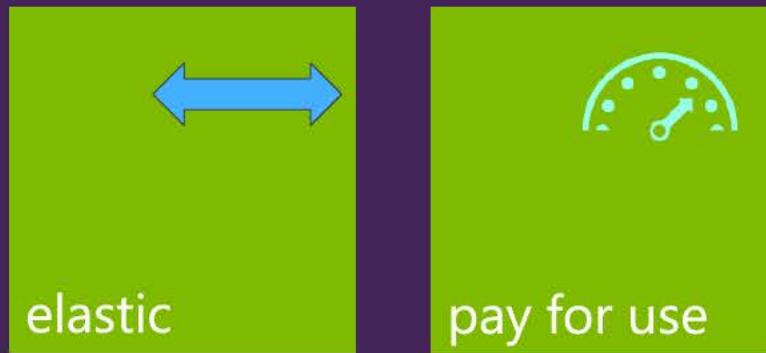


# Why Use Azure for Big Compute?

For existing scenarios:



New possibilities:



- Small organizations with no on-premises servers
- Cloud-only scale
- 100'000s of VM's
- Do things not previously possible

# Business Use Case

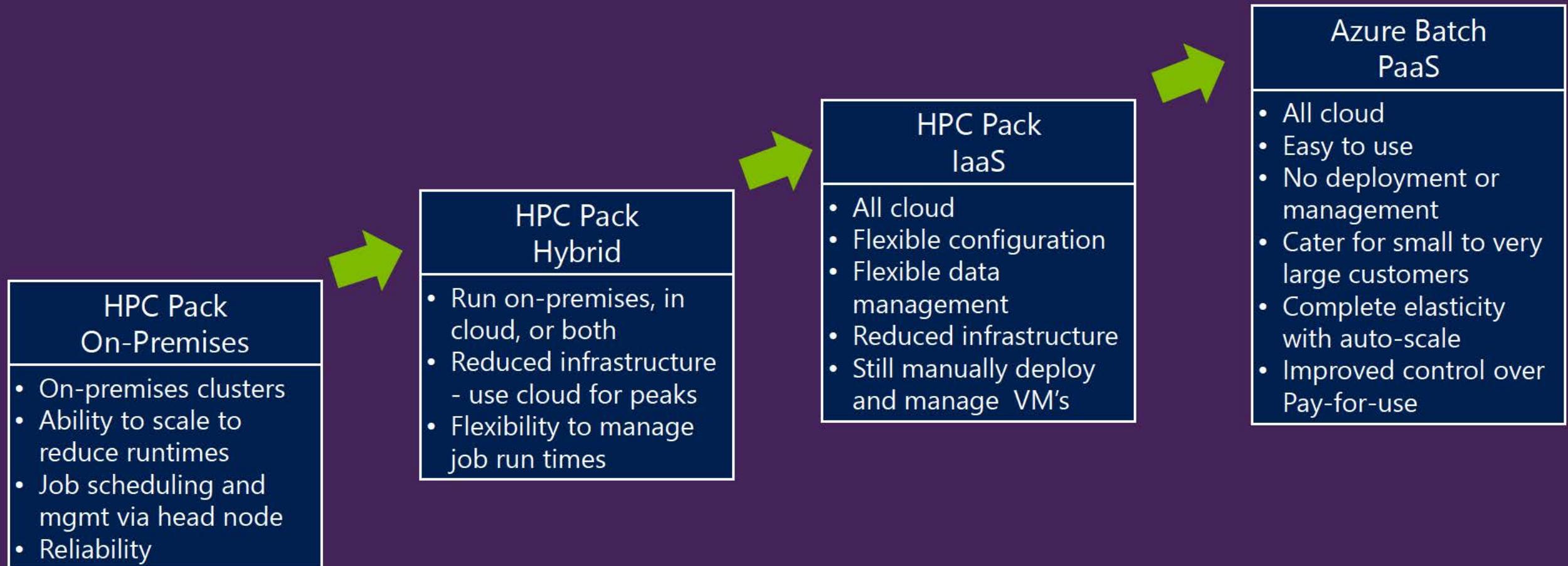
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RiskAgility FM



TOWERS WATSON The logo features the company name in a bold, black, sans-serif font next to a red, stylized 'tw' monogram.

# Big Compute Evolution



# RiskAgility FM



- RiskAgility FM :

- Designed for Actuaries to develop and run models to manage risk and safeguard solvency with a primary focus on the life insurance industry
- Projection system to model asset and liability cashflows over the term of policies

- Azure Batch Usage:

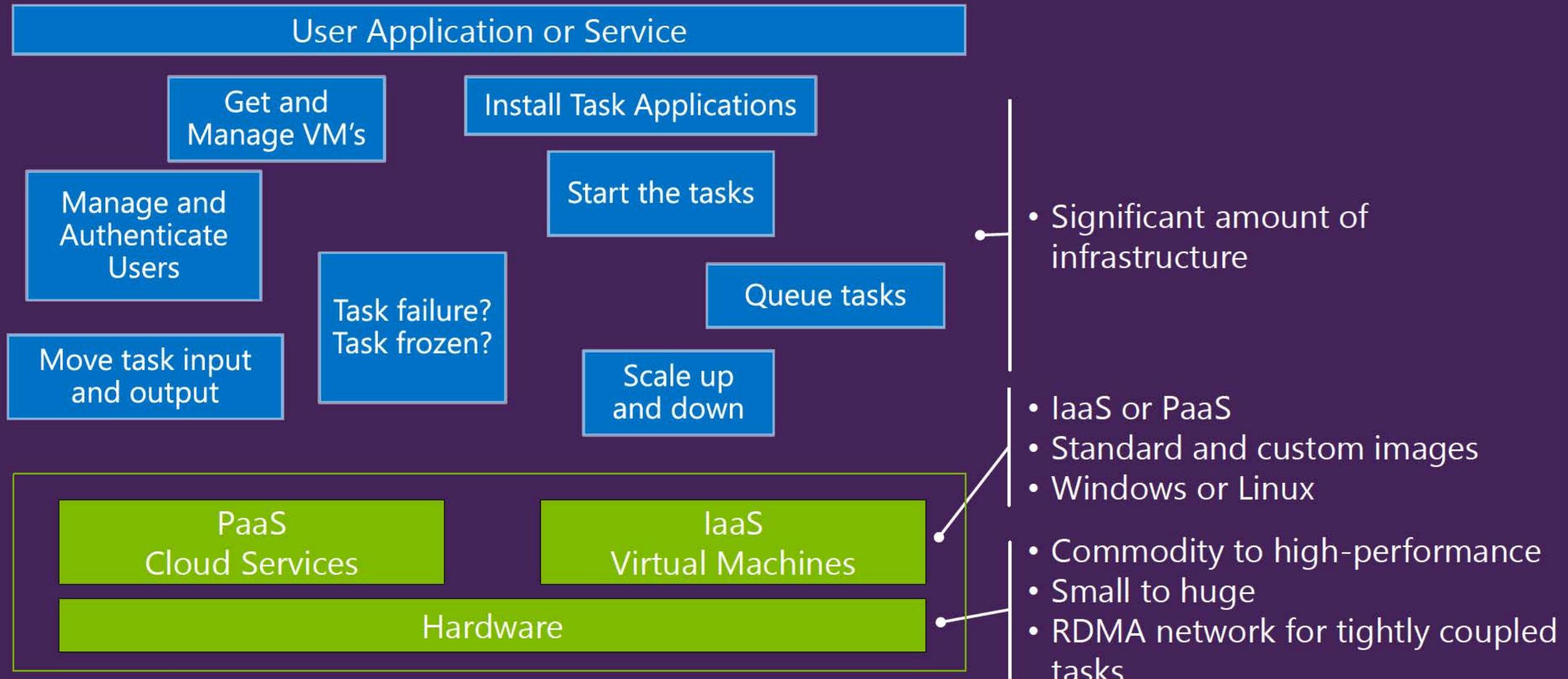
- Large scale deployments without infrastructure
- Auto-scale to meet demand (reduced costs and administration)
- Opens up grid computing to smaller clients
- Lightweight REST interface and wrapper API

Azure Batch

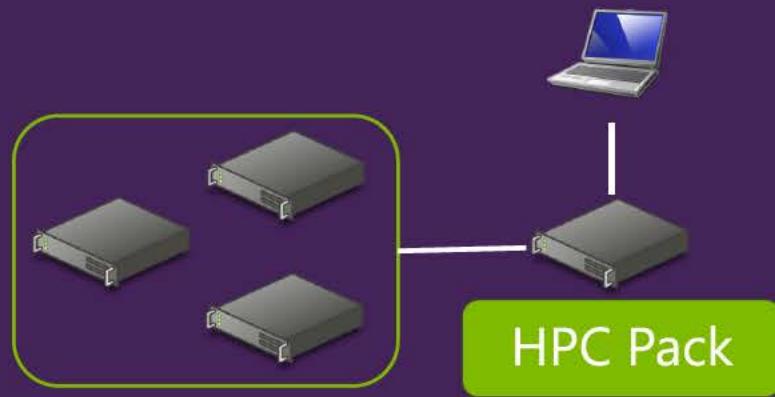
Demo:

RiskAgility FM 

# Azure Compute

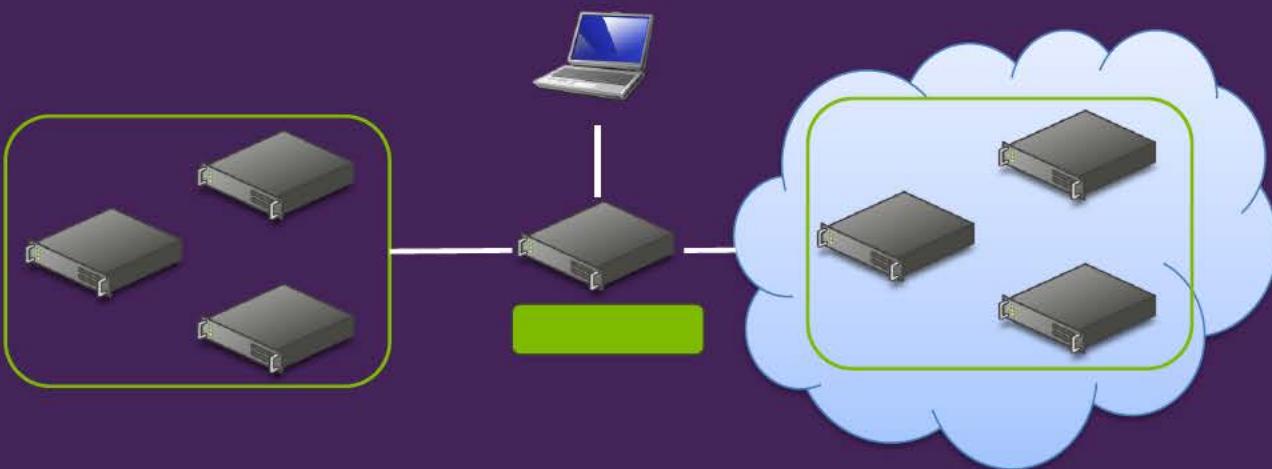


# HPC Pack: On-Premises and Hybrid Big Compute

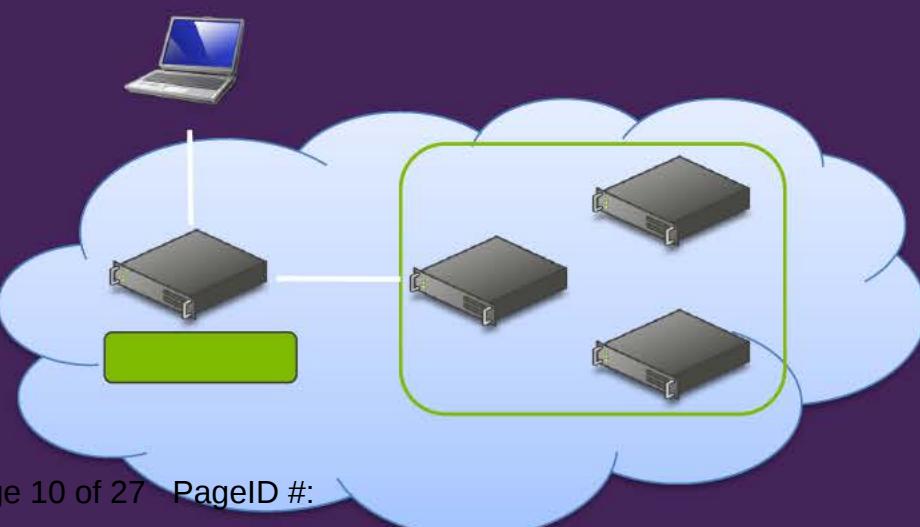


On-premises head node and clusters

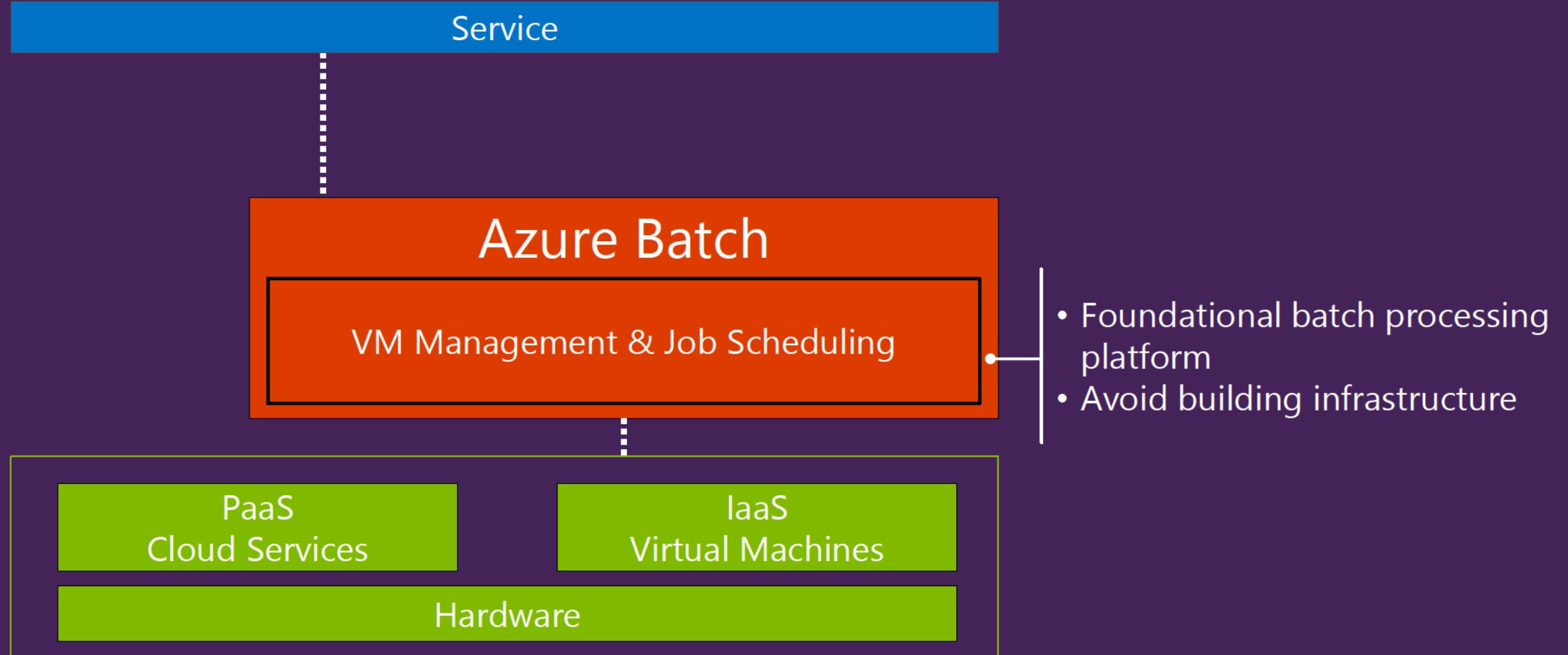
Head node in Virtual  
Machines + cloud clusters



On-premises head node and clusters + cloud clusters



# Azure Batch - Add Big Compute to a service



# Azure Batch

Caller:

Specify and configure the VM's

Supply the task applications and files

Provide the command lines

Optionally specifies a schedule for recurring work

Service provides:

Get and manage the VM's

Copy files between Azure Storage and VM's

Allocate and run tasks on available VM's

Queue work until VM's are available

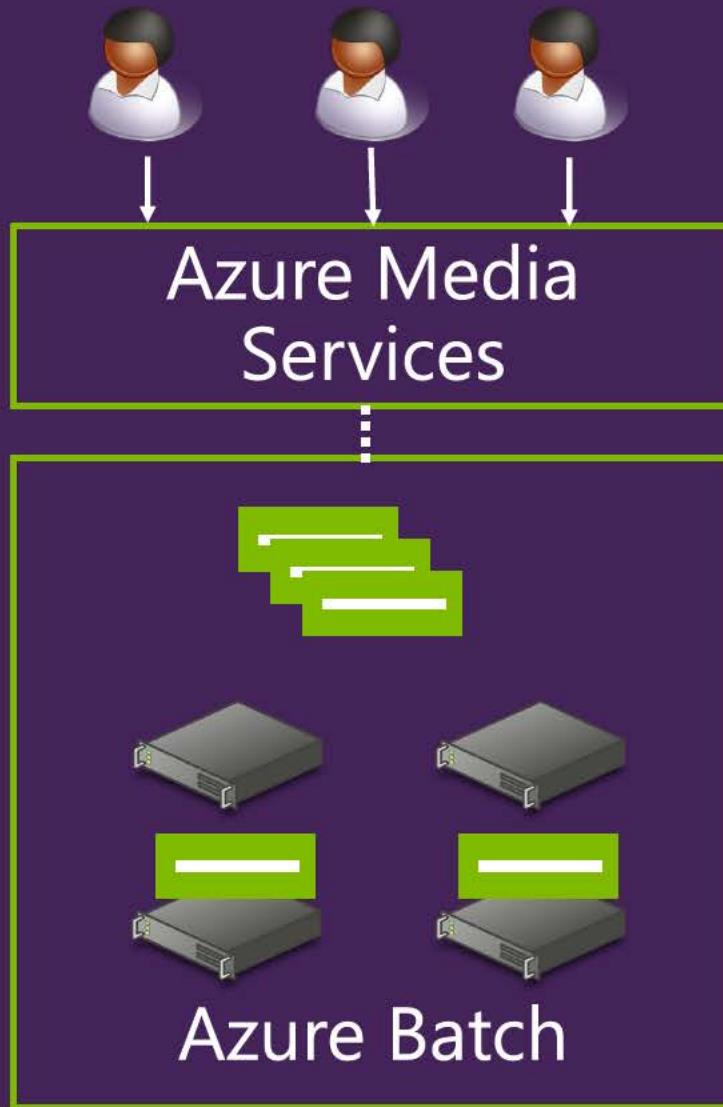
Manual or automatic scale up and down

Handle errors; e.g. re-queue on VM or application failure; kill frozen application

Monitoring information

# Demo: Building a service using Azure Batch

# Use Case – Azure Media Services



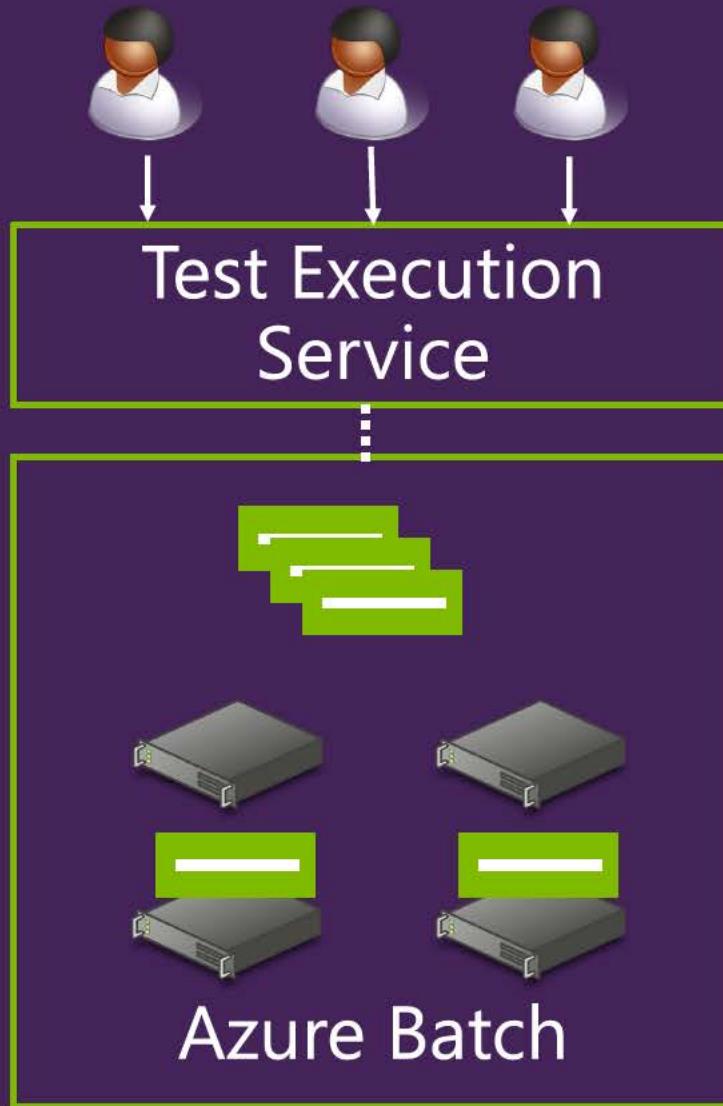
## Azure Media Services:

- Media transcoding platform service
- Media-focused UI, API, pricing, SLA, etc.
- Uses Batch for all transcodes
- Supplies the transcoding applications
- Hides the VM's

## Azure Batch Usage:

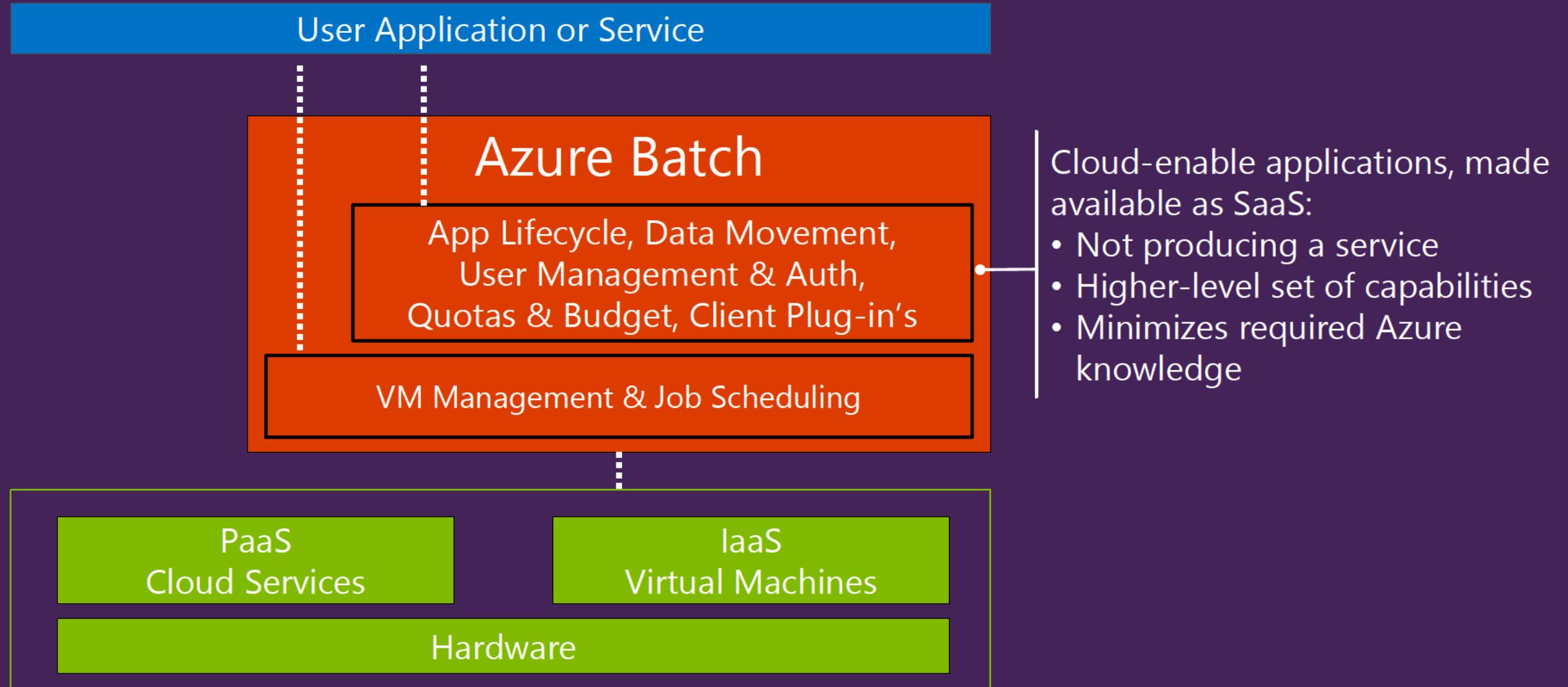
- Long-term pool of VM's with transcoding applications installed
- Pool scaled by Media Services according to load

# Use Case – Software Test Service



- Test Execution Service:
  - Engineers submit test suites for execution
  - Used for many Azure services
- Azure Batch:
  - Pool of VM's created for each test suite
  - Test suite is completely custom application
  - Pool auto-scaled according to queue size
  - Spread across multiple regions with multiple Batch accounts

# Azure Batch - Cloud-enable applications

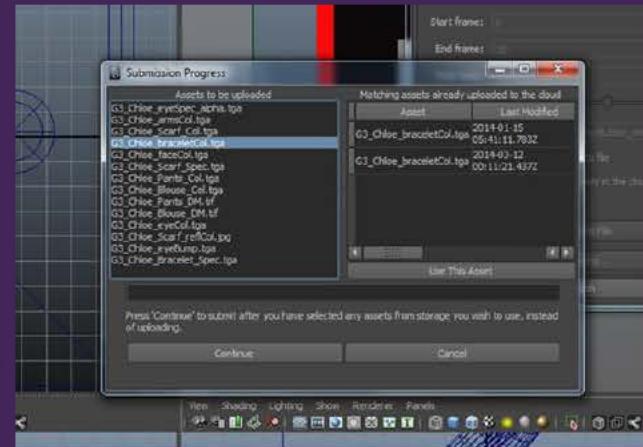
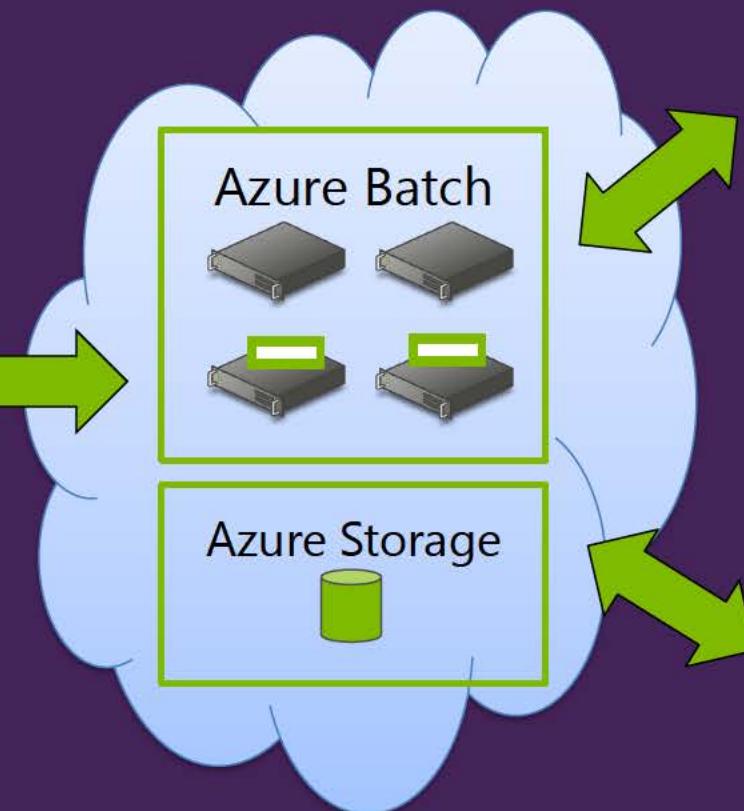


# Overview

## Developer



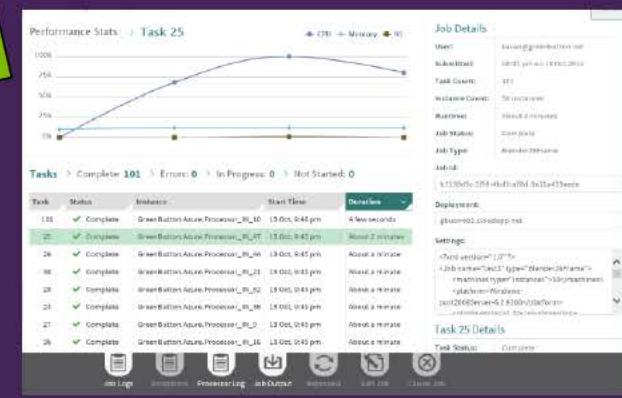
Use Batch SDK to cloud-enable & upload the app



## End-User

- Submit jobs via plug-in
- Sync data
- Monitor via plug-in and/or portal

## Ops / Admin



- User & group mgmt.
- Permissions
- Job & VM monitoring
- Usage reporting
- Quota mgmt.
- Troubleshooting

# Demo: Cloud-Enabling Applications with Azure Batch

# Use Case – Animated Feature Film Rendering



- PROAN Entertainment – ‘Pepito – La Película’
  - 90 minute 3D animated feature film
  - Would have taken over 13 years to render using existing on-premises cluster
  - Rendered entirely in Azure using Blender in about 3 months

# Related Azure Services

## Batch

- Large-scale application execution - 1000's of VM's, millions of tasks
- Existing or new applications, no special API required
- Invoke via command line
- On-demand or recurring work

## Scheduler

- Recurring invocation of services via HTTP or Storage Queues
- Services actually execute the work
- Standalone service and embedded in Websites and Mobile Services

## WebJobs

- Small-scale execution of work within context of web site
- WebJobs SDK simplifies app development
- Now GA!

## Mobile Services Scheduled Job

- Small-scale execution of work within context of Mobile Services

## HDInsight

- Managed Hadoop as a Service for processing Big Data
- Built on the Hadoop ecosystem: Hive Hbase, Storm, Mahout and more
- Leverages Azure Storage for data storage

## Automation

- Scheduled execution of runbooks to automate end to end processes across Azure and 3rd party services
- Built on PowerShell Workflow so you can write your own PowerShell modules or use existing modules

## Worker Roles Virtual Machines

- Full control, but most work

# Summary

Azure makes HPC and large-scale compute more broadly accessible, radically easier, and more cost-effective

Comprehensive set of capabilities:

Enterprise ready infrastructure

Choice of VM's - commodity to high-performance

IaaS and PaaS, Windows and Linux

On-premises, hybrid, and cloud-only

Azure Batch Preview now available providing job scheduling as-a-service!

# Related content

④ Find Me Later At. . .

④ Ask The Experts

④ Azure booth

# DBI Track resources

- ④ 27 Hands on Labs + 8 Instructor Led Labs in Hall 7
- ④ Free SQL Server 2014 Technical Overview e-book  
[microsoft.com/sqlserver](http://microsoft.com/sqlserver) and [Amazon Kindle Store](#)
- ④ Free online training at Microsoft Virtual Academy  
[microsoftvirtualacademy.com](http://microsoftvirtualacademy.com)
- ④ Try new Azure data services previews!

[Azure Machine Learning](#), [DocumentDB](#), and [Stream Analytics](#)

# Resources



Channel 9

Sessions on Demand



<http://channel9.msdn.com/Events/TechEd>

## TechNet



Resources for IT Professionals

<http://microsoft.com/technet>

## Learning



Microsoft Certification & Training Resources

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## Developer Network



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Top Reasons

Showing 1 to 50 of 76 Page 1 2

DEV-B310 Getting Started with TypeScript  
Monday, May 12 1:15 PM - 2:30 PM Room: Hilton L2 Ballroom D  
[Evaluate Session](#) (circled)  
Speaker(s): Jonathan Turner  
Track: Developer Platform and Tools  
Session Type: Breakout  
PPTX(s): [DEV-B310.pptx](#) (circled)  
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